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NASA TECH BRIEF

Measurement Technique for the Determination of Antenna Directivity

The problem:

The directivity of an antenna—the ratio of radiation intensity in a given direction to average radiation intensity—is conventionally measured by integrating conical antenna patterns. In order to generate conical patterns, rotation in elevation with discrete rotation in azimuth is required. The instrumentation required to produce the rotation in elevation with discrete rotation in azimuth is necessarily composed of complex slip-rings and rotary joints; use of large, heavier models is also limited.

The solution:

The measurement of great circle patterns requires rotation in azimuth with discrete rotation in elevation. This technique eliminates a set of slip-rings and rotary joints, and permits the use of larger models since only continuous azimuth rotation is required.

How it's done:

A spherical coordinate system describes the rotation of the model antenna. Measurements establish the angles for maximum radiation intensity and permit plotting the radiation as a function of ϕ angles at discrete θ angles. Average radiation intensity is found by double integration of the radiation intensity function over the entire sphere. While this method is convenient, a special technique is required to integrate measurements while they are being plotted. The radiation function is electronically multiplied by the sine of ϕ by coupling the detected signal into a sine potentiometer which is mechanically linked to a polar recorder turntable; the product is fed to an electronic integrator. The integration process is simplified by multiplying the radiation function by the sine of ϕ rather than the first integral by the sine of θ.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

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Patent status:

No patent action is contemplated by NASA.

Source: L. Rainwater and R. Lipin of
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Category 01